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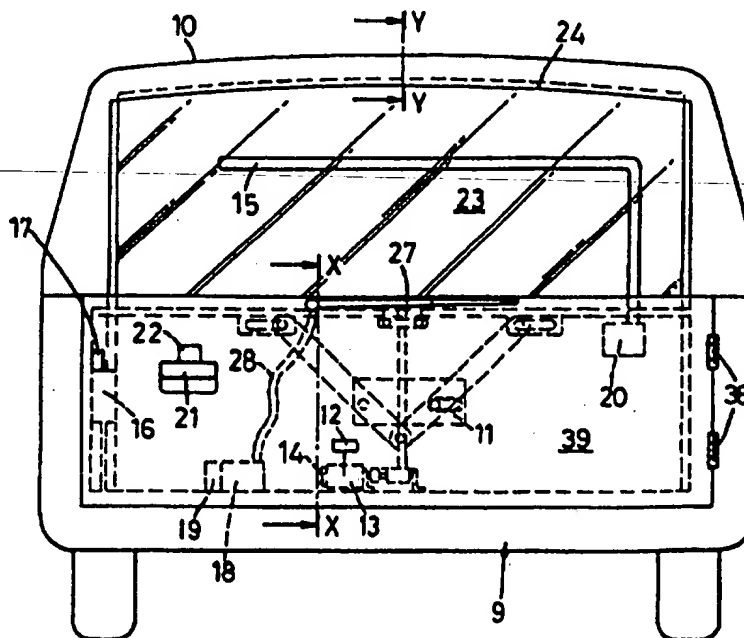
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(54) Title: A MOTOR VEHICLE



(57) Abstract

A motor vehicle is disclosed having at least one door (39) supporting an electrically moveable frameless window (23). The window (23) is engaged in its closed position at its upper edge with a U-shaped seal (24) from which it needs to be disengaged before the door (39) can be opened. An electronic controller (11) is arranged to control a window lift motor (13) and an electrically operated door latch (16) in such a manner that the door cannot be open until the window (23) has been lowered a pre-determined amount.

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A Motor Vehicle

This invention relates to a motor vehicle and in particular to a door mounted electrically actuated frameless window assembly for a motor vehicle.

It is a problem when using a frameless window assembly in an opening door that if the upper edge of the window is engaged within a window seal a significant side load is exerted on the window when the door is opened and closed.

It is known from GB-1562318 to provide a window winding mechanism for a motor vehicle that is operative to lower the window a small amount during opening and closing of the door.

It is a problem with such an arrangement that if the door is opened suddenly the window will not have time to clear from the door seal.

It is an object of the invention to overcome the problem associated with the prior art.

According to the invention there is provided a motor vehicle having number of doors at least one of which supports a frameless electrically actuated window, the window being movable by an electric motor in response to a signal received from an electronic controller between a closed position in which the upper edge of the window is engaged within an upper door seal attached to part of the

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roof section of the motor vehicle and an open position in which the window is retracted into a lower part of the door, an electrically actuated door lock mechanism mounted on part of the structure of each door to selectively secure the door in a closed position and an operator controllable door release device attached to each door, the door release device including sensor means to sense when a door open input is applied to the door release device, wherein in response to a door open input being sensed by said sensor means the sending of a door unlocking signal to the electrically actuated door lock mechanism associated with that door is delayed until the respective window has been lowered to a predetermined open position which is sufficient to disengage the window from the upper door seal.

The door of the motor vehicle may be a side hinged rear door.

The door release device may include an external door handle and or an internal door handle. In which case the sensor means to sense when a door open input is applied may be a microswitch associated with a door handle.

The delay between the application of the input to the door release device and the actuation of the door lock mechanism may be a pre-set time delay.

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Alternatively, the delay between the application of the input to the door release device and the actuation of the door lock mechanism is dependant upon the time taken for the window to reach said predetermined open position.

Preferably, the rear door may be fitted with a sensor to sense when the rear door is open and if the signal from the sensor indicates that the rear door is open then the closing of the rear window beyond said predetermined open position is prevented.

Advantageously, in the open position the rear window is fully retracted into the lower structure of the rear door.

The rear window may be fitted with an electrically actuated window wiper which is moved into a parked position before the rear window is moved to said predetermined open position.

The rear window may be fitted with an electric screen heater which is switched to an off state before the rear window is moved to said predetermined open position.

The invention will now be described by way of example with reference to the accompanying drawing of which:-

Fig.1: is a rear view of a motor vehicle including a door mounted electrically actuated frameless window assembly according to the invention;

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Fig.2: is a cross section on the line X-X on Fig.1;

Fig.3: is a cross section on the line Y-Y on Fig.1;

Fig.4: is a block diagram of an electronic control circuit according to the invention;

Fig.5: is a simplified flow chart showing the basic logical operations performed by the control circuit of Fig.4.; and

Figs.6A and 6B: are flow charts showing in greater detail the logical operations performed by the control circuit of Fig.4.

With reference to Figs.1 to 5 there is shown a motor vehicle having a rear body structure 9 to which is releasably secured a detachable rear roof section 10.

A rear door 39 is pivotally connected to the rear body structure 9 of the motor vehicle by means of a pair spaced apart hinges 38 and is securable in a closed position by means of an electrically operated locking means 16 attached to part of the structure of the rear door 39.

An operator controllable door release in the form of a door handle 21 is connected to an associated microswitch 22 to provide an open door signal to an electronic controller 11.

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The electronic controller 11 is also connected to and receives inputs from a door position sensor 17 used to sense whether the rear door 39 is open or closed and a window position sensor 14 used to sense the position of a moveable window pane 23.

The window 23 is slidably supported by the rear door 39 and is moveable from a fully closed position, as shown in Figures 1 and 3, in which it is engaged at its upper edge with a 'U' shaped roof seal 24 to a fully open position, as shown in Fig.2, in which the window 23 is fully retracted into the lower part of the rear door 39. The window 23 is moveable between said open and closed positions by means of a window lift motor 13 in response to a control signal from a window lift motor controller 12 controlled by the electronic controller 11.

A driver operable switch (not shown) is connected to the electronic controller 11 to provide a means of communicating a desired window position.

The window 23 is fitted with a heating element 15 which is connected to the electronic controller 11 by means of a rear screen heater controller 20 in the form of an electric relay. A driver operable switch (not shown) is connected to the relay 20 to provide a means of switching on or off the heating element 15.

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A rear screen wiper 27 is connected to a wiper motor 18 by means of a flexible drive 28 and is moveable from an off-screen parked position, as shown in Figs.1 and 2, to an on screen wiping mode by means of the motor 18 in response to a signal received from a wiper motor controller 19. The wiper motor controller 19 is connected to and receives control signals from the electronic controller 11 and a driver operable switch (not shown).

Operation of the control system is as follows, when the door handle 21 is actuated by a person wishing to open the rear door 39 the microswitch 22 senses the actuation of the door handle 21 and sends a signal to the electronic controller 11 indicating that a door open input has been received.

Before permitting the door 39 to be opened the electronic controller 11 carries out a number of checks and procedures to put the door 39 into a safe opening condition.

Firstly the electronic controller checks the state of the rear screen heater 15 and if it is switched on sends a signal to the rear screen heater controller 20 to disable the heater element 15. The electronic controller also checks whether the wiper 27 is parked off screen and if not sends a signal to the wiper motor controller 19 to put the wiper 27 into a parked position before isolating the wiper motor controller 19.

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Finally the electronic controller 11 checks the signal being received from the window position sensor 14 to determine whether the window 23 is fully closed, as shown by reference numeral 'A' on fig 3, or lowered beyond a pre-determined position 'B' corresponding to a position that will allow the top edge of the window 23 to become readily disengaged from the roof seal 24.

If the signal from the window position sensor 14 indicates that the window 23 is already lowered below said pre-determined position 'B' then the electronic controller 11 sends a signal to the locking means 16 to unlock the rear door 39. However if the window 23 is sensed to be fully closed or closed beyond said pre-determined position 'B' then the electronic controller 11 sends a signal to the window lift motor controller 12 to lower the window to said pre-determined position 'B' and monitors the position of the window 23 by means of the window position sensor 14. When the window reaches the pre-determined position 'B' the electronic controller 11 switches off the window lift motor 13 via the window lift motor controller 12 and sends a signal to the electrically operated locking means 16 to unlatch the rear door 39.

It is not therefore possible to open the rear door 39 before the window 23 has been lowered to or beyond said pre-determined position. In addition the electronic controller 11 ensures that the rear screen heater 15 will

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always be switched off and the wiper 27 parked before the window 23 is lowered from the fully closed position 'A'.

So long as the electronic controller 11 receives a signal from the door position sensor 17 indicating that the rear door 39 is open it is operable to ensure that the window 23 remains at or below the pre-determined position by disabling the window lift motor controller 12 and maintains the heater element 15 and the wiper 27 disabled.

Therefore even if a window up command is received from the driver operable switch the window 23 will not move. This ensures that the door 39 cannot be accidentally closed with the window 23 in the fully up or closed position which would cause the top edge of the window 23 to impact against the outer lip of the roof seal 24. Such an impact could result in the window 23 being broken or damage occurring to the window lift mechanism.

As soon as the door 39 is closed the electronic controller 11 is operable to restore full functionality to the heater element 15, the wiper 27 and the window lift motor controller 12 allowing them to be operated by the driver operable switches. In addition if the window 23 is only open to position B then the electronic controller 11 automatically closes the window 23.

As an alternative to using the actual position of the window 23 to determine when the door locking means can

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safely be operated the electronic controller can be programmed to simply lower the window for a pre-determined length of time calculated to be sufficient for the window 23 to be lowered beyond said pre-determined position 'B'.

It will be appreciated that the door open input signal could be generated by a microswitch attached to an internal door handle or from a switch or keypad on the door.

To prevent the rear door 39 from accidentally opening when the vehicle is in motion a vehicle speed sensor (not shown) is used to provide an indication of vehicle motion to the electronic controller 11. When the signal from the speed sensor indicates that the vehicle is in motion the electronic controller remains unresponsive to a door open signal from the microswitch 22.

CLAIMS

1. A motor vehicle having number of doors at least one of which supports a frameless electrically actuated window (23), the window (23) being movable by an electric motor (13) in response to a signal received from an electronic controller (12) between a closed position in which the upper edge of the window (23) is engaged within an upper door seal (24) attached to part of the roof section of the motor vehicle and an open position in which the window (23) is retracted into a lower part of the door, an electrically actuated door lock mechanism (16) mounted on part of the structure of each door to selectively secure the door in a closed position and an operator controllable door release device (21) attached to each door, the door release device (21) including sensor means (22) to sense when a door open input is applied to the door release device (21) wherein in response to a door open input being sensed by said sensor means (22) the sending of a door unlocking signal to the electrically actuated door lock mechanism (16) associated with that door is delayed until the respective window (23) has been lowered to a predetermined open position which is sufficient to disengage the window (23) from the upper door seal (24).

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2. A motor vehicle as claimed in claim 1 in which the door of the motor vehicle is a side hinged rear door (39).
3. A motor vehicle as claimed in Claim 1 or in Claim 2 in which the door release device includes an external door handle (21).
4. A motor vehicle as claimed in any of Claims 1 to 3 in which the door release device includes an internal door handle.
5. A motor vehicle as claimed in Claim 3 or in Claim 4 in which the sensor means to sense when a door open input is applied is a microswitch (22) associated with a door handle (21).
6. A motor vehicle as claimed in any preceding claim in which the delay between the application of the input to the door release device (21) and the actuation of the door lock mechanism (16) is a pre-set time delay.
7. A motor vehicle as claimed in any of Claims 1 to 6 in which the delay between the application of the input to the door release device (21) and the actuation of the door lock mechanism (16) is dependant upon the time taken for the window (23) to reach said predetermined open position.
8. A motor vehicle as claimed in any of Claims 2 to 7 in which the rear door is fitted with a sensor (17) to

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sense when the rear door (39) is open and if the signal from the sensor (17) indicates that the rear door is (39) open then the closing of the rear window (23) beyond said predetermined open position is prevented.

9. A motor vehicle as claimed in any of Claims 2 to 8 in which in the open position the rear window (23) is fully retracted into the lower structure of the rear door (39).
10. A motor vehicle as claimed in any of Claims 2 to 9 in which the rear window (23) is fitted with an electrically actuated window wiper which is moved into a parked position before the rear window (23) is moved to said predetermined open position.
11. A motor vehicle as claimed in any of Claims 2 to 10 in which the rear window (23) is fitted with an electric screen heater (15) which is switched to an off state before the rear window (23) is moved to said predetermined open position.

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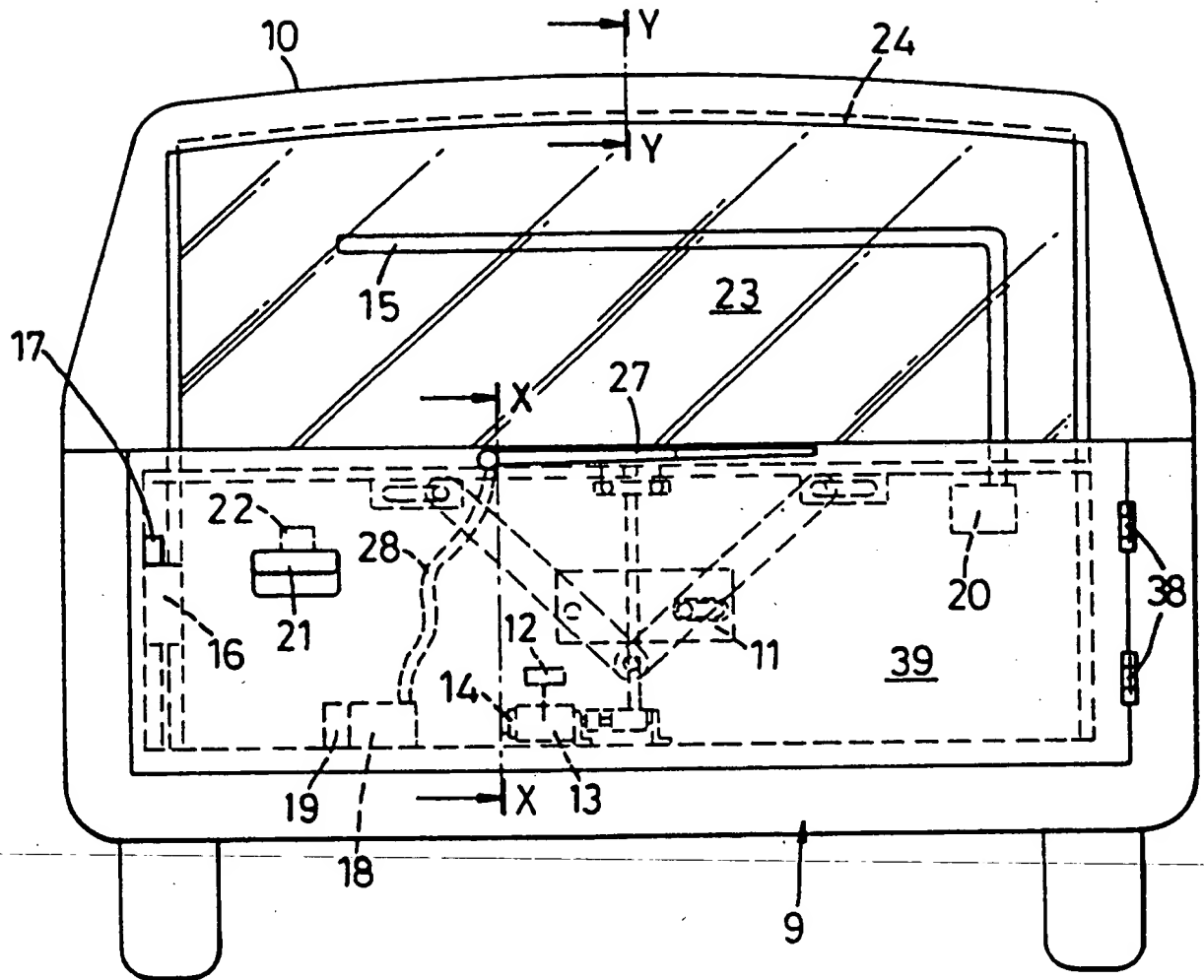


Fig. 1

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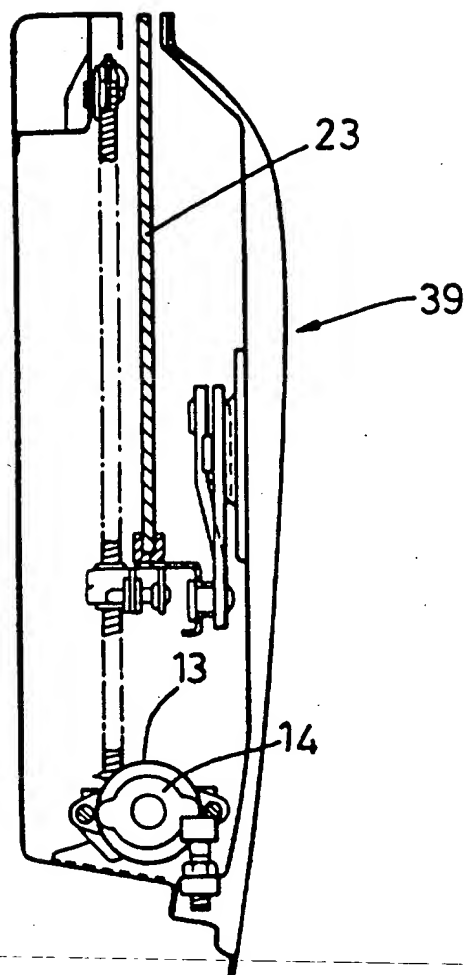


Fig. 2

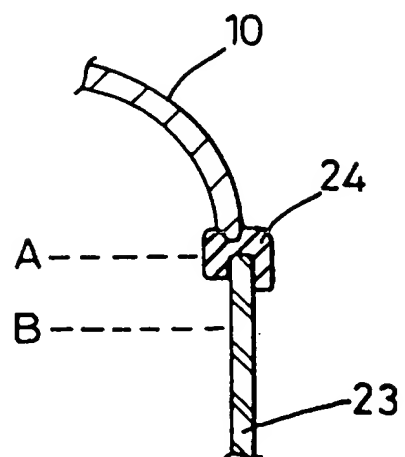


Fig. 3

INTERNATIONAL SEARCH REPORT

 Int. Application No
 PCT/GB 96/00718

 A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 B60J7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B60J B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,C,42 03 512 (AUDI) 19 May 1993 see column 2, line 27 - column 4, line 11 see column 4, line 28 - column 5, line 32; figures 1-3	1,3-7
A	FR,A,2 582 595 (LAND - ROVER SANTANA) 5 December 1986 see page 1, line 1 - page 2, line 28 see page 4, line 14 - line 19; figure 3	2,9-11
A	GB,A,1 032 829 (WILMOT - BREEDEN) 15 June 1966 see the whole document	1-4,9
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☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

5 July 1996

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INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 96/00718

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 864 153 (MC. INTOCH) 5 September 1989 see the whole document ---	1,3-7
A	DE,A,41 07 921 (FABRICA ITALIANA SERRATURE) 19 September 1991 see the whole document ---	1,3-7
A	US,A,5 054 686 (CHUANG) 8 October 1991 see column 6, line 50 - column 8, line 33; figure 2 -----	1,3-7

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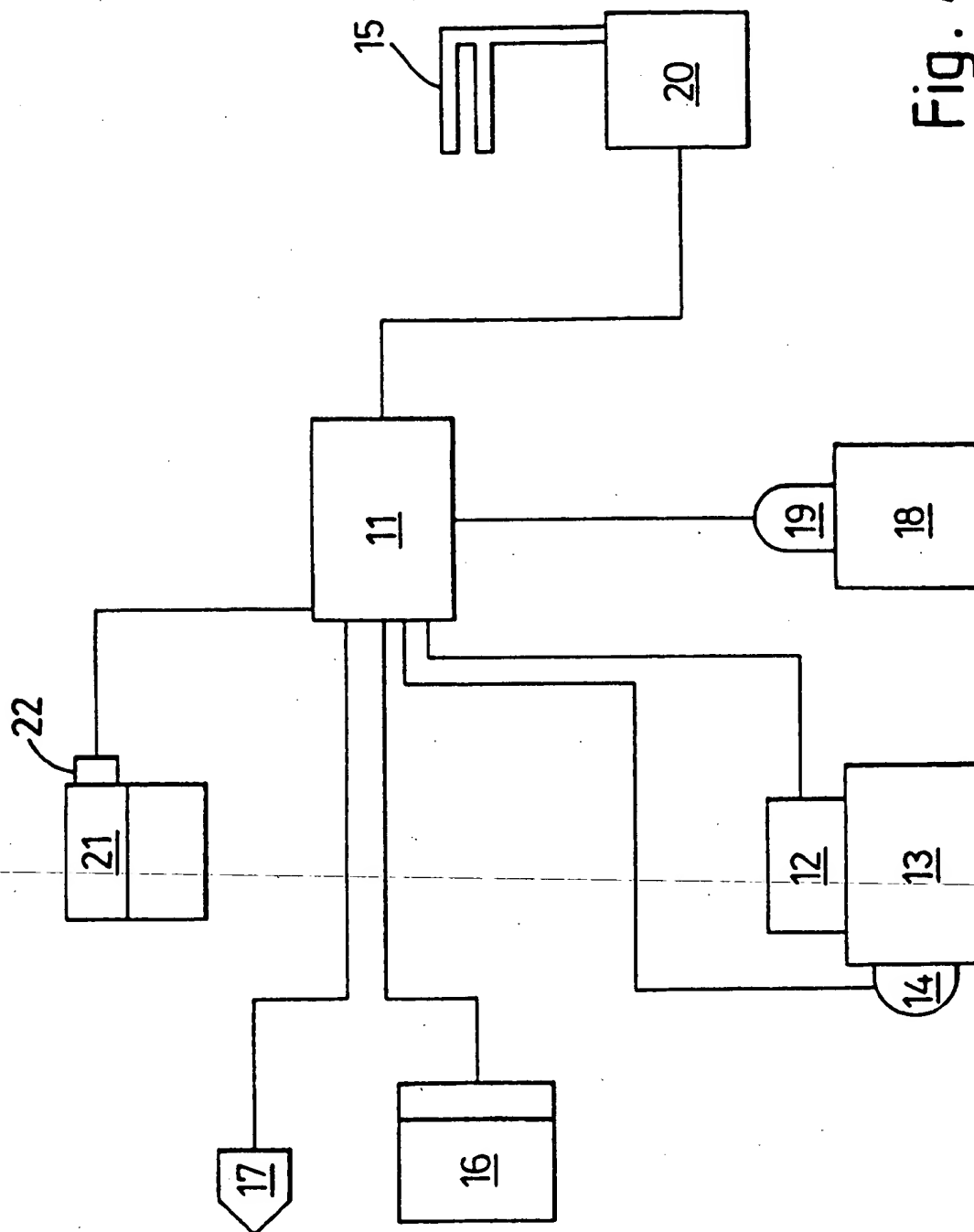


Fig. 4

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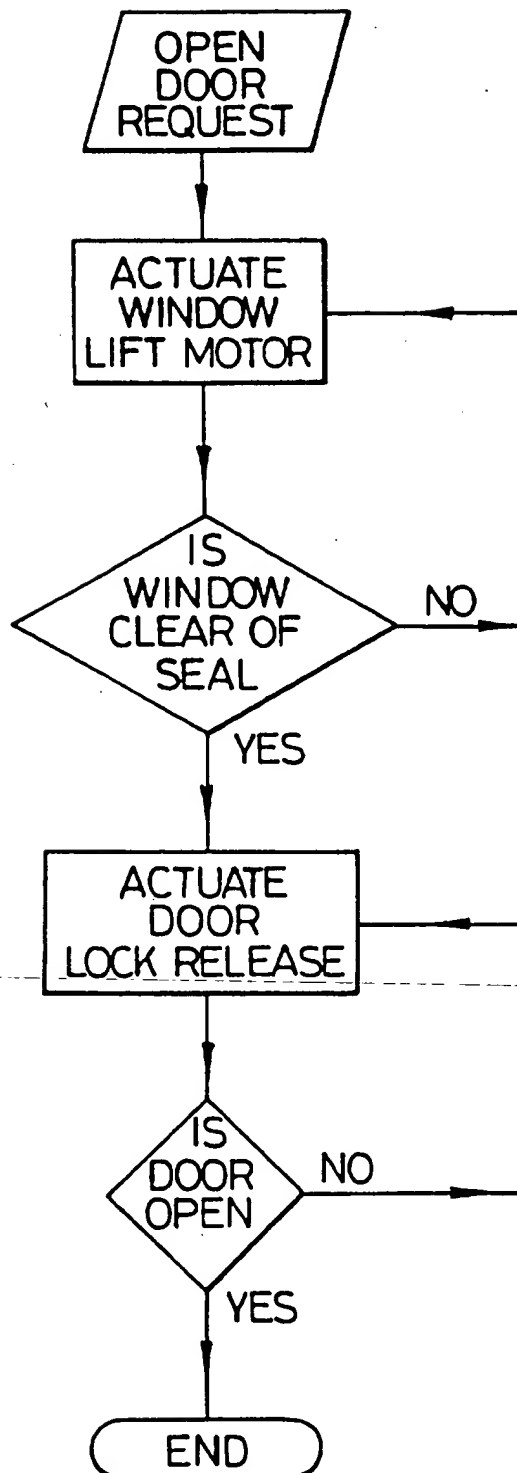


Fig. 5

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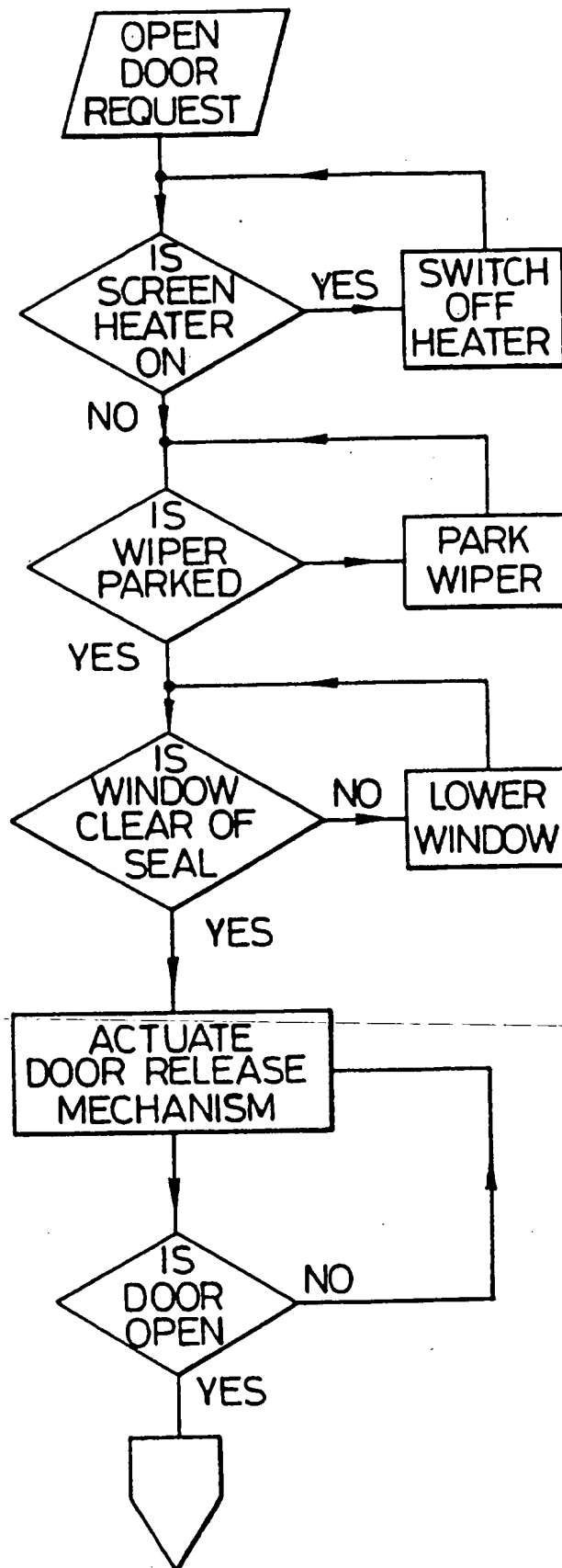


Fig. 6A

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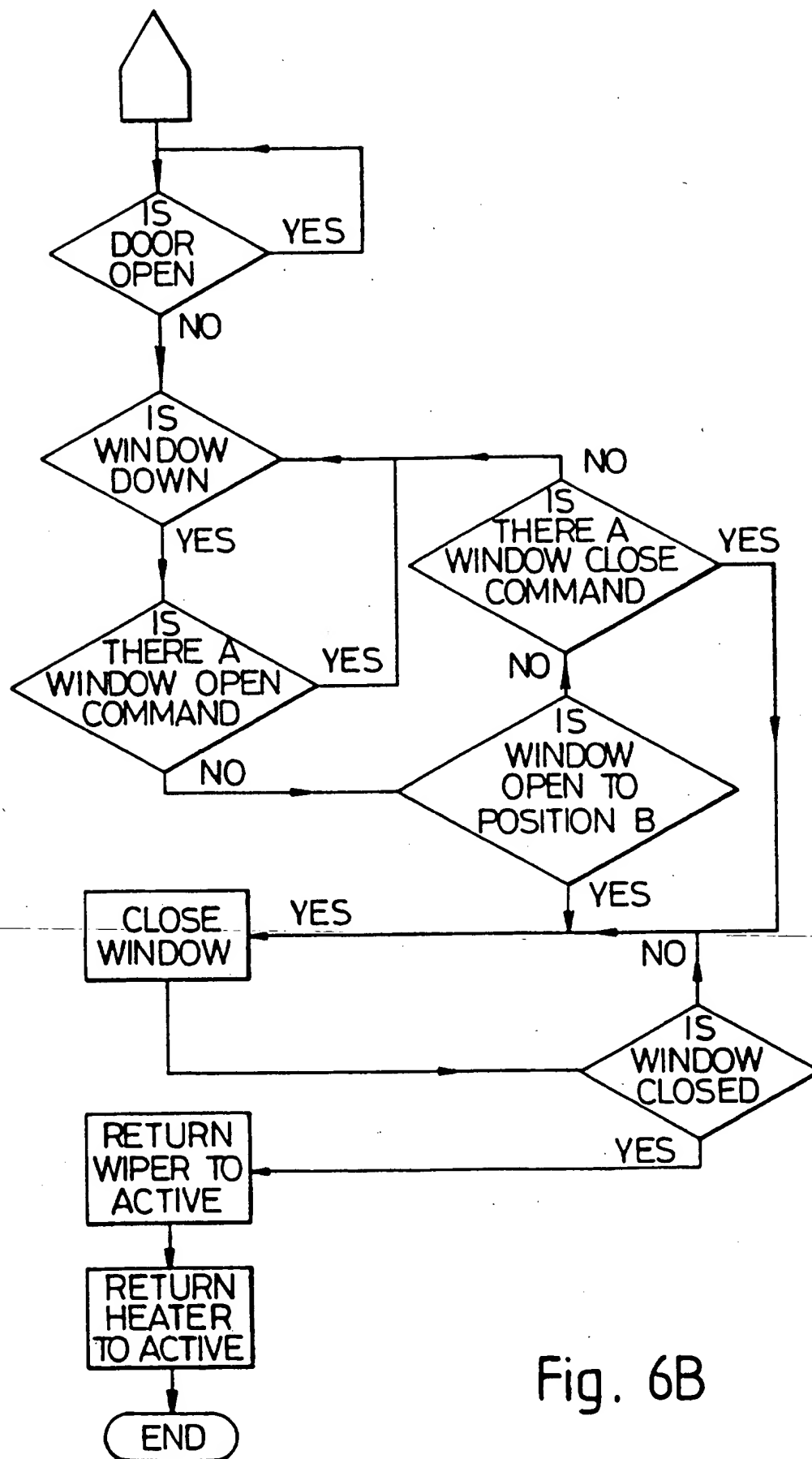


Fig. 6B

INTERNATIONAL SEARCH REPORT

Int. Appl. No.
PCT/GB 96/00718

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C-4203512	19-05-93	NONE	
FR-A-2582595	05-12-86	GB-A, B 2185943 JP-A- 62122822	05-08-87 04-06-87
GB-A-1032829		NONE	
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